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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/069,754

02/28/2002

Roger W. Whatmore

112113

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7590

01/11/2005

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Alexandria, VA 22320

EXAMINER

ALANKO, ANITA KAREN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/069,754

Applicant(s)

WHATMORE ET AL.

Examiner

Anita K Alanko

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on RCE 10/26/04.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6-13 and 15-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6-13 and 15-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

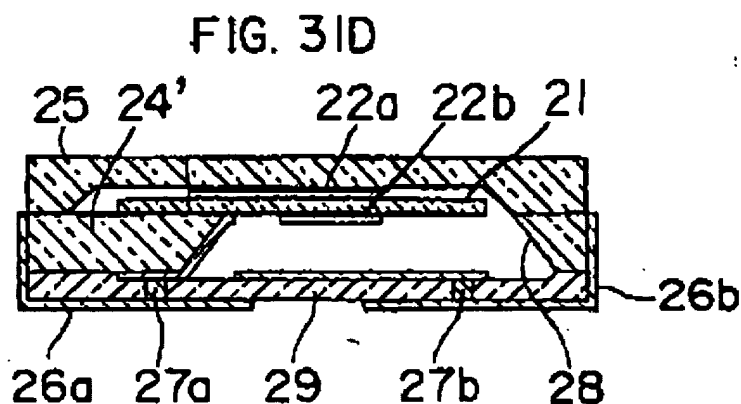
Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/28/04 has been entered.

Claim Rejections - 35 USC § 103

Claims 1-2, 4, 9-13, 15-17, 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1).

Eda discloses a method for hermetically packaging a bulk acoustic resonator device



including the steps of:

providing a first wafer 24' ("holding wafer" Fig. 31D, col.42, lines 21-58, especially lines 51-52) having a first surface and a second surface that face toward opposite directions, with a bulk acoustic resonator device 21 disposed on the first surface (the top surface of 24'), the first wafer further having a cavity 28 formed at a position corresponding to the bulk acoustic resonator device and open at the second surface;

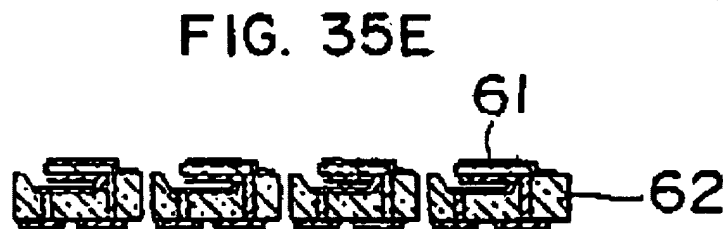
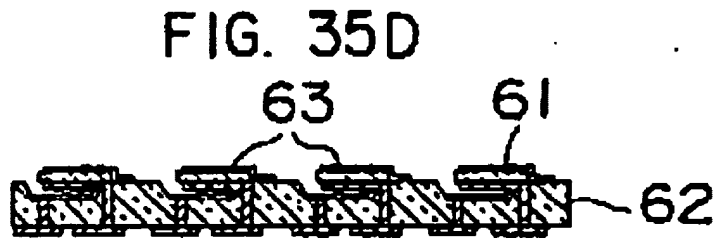
providing a second wafer 25 having a well (col.42, lines 36-37);

providing a third wafer 29 (col.42, lines 52-53);

bonding the second wafer to the first surface of the first wafer and bonding the third wafer to the second surface of the first wafer to form a composite wafer in which the bulk acoustic resonator device of the first wafer is aligned with the wells of the second wafer and sealed by the second wafer (col.42, lines 36-38) and the cavities of the first wafer are sealed by the third wafer (see Fig.31D).

Eda does not explicitly disclose that a plurality of bulk acoustic resonator devices are formed, that the first wafer has a plurality of cavities, or that the second wafer has a plurality of wells. Rather, Eda depicts in Figure 31D that only one of each is formed. Eda also does not disclose to saw to separate the individual devices.

However, in a different embodiment Eda teaches that a plurality of bulk acoustic resonator devices (quartz plate 61 with electrodes 67, 63) can be formed on a first wafer 62, followed by sawing to separate the holding member (col.47, lines 40-41; Fig.35D-35E).



The advantage of forming a plurality of devices on a first wafer followed by separation is that they can be mass-produced (col.7, lines 65-67), which is a more efficient method of forming devices.

It would have been obvious to one with ordinary skill in the art to form a plurality of devices with a corresponding plurality of cavities and wells followed by sawing the composite wafer in the method of Eda because Eda teaches in a different embodiment that forming a plurality of devices on a substrate followed by separation is a useful technique for forming devices and because Eda teaches that an advantage is mass production, which is a more efficient method of forming devices.

As to amended claim 1, Eda discloses to pre-form holes so that the holes reach metal tracks connected to the bulk acoustic resonator devices (col.41, lines 64-66). Eda does not disclose to form holes in the composite wafer after formation of the composite wafer.

Kawai teaches that it is a useful to form holes after formation of a composite wafer and to thereafter fill the holes with metal for connection to metal tracks to devices formed in the composite wafer (col.9, line 60-col.10, line 14). The holes can be formed in either the top substrate or the bottom substrate (Fig.1, Fig.20). It would have been obvious to one with ordinary skill in the art to form the hole after formation of the composite wafer and to fill the holes with metal for connection in the method of Eda because Kawai teaches that it is known useful alternative technique to form holes after formation of a composite wafer rather than before.

As to claim 2, Eda discloses that the bulk acoustic resonator device comprises a piezoelectric layer 21 (quartz) sandwiched between two metal electrodes 22a, 22b (col.42, lines 26-28 and also Fig.31E).

As to claim 4, Eda discloses to deposit metal layers 26a, 26b (col.42, line 29) on the edges of chips including the bulk acoustic resonator devices in order to allow electrical contacts to be made to the bulk acoustic resonator devices. Eda does not disclose deposition of the metal layers after separation, however this would have been obvious to one with ordinary skill in the art in order to form a functional device after separation.

As to claim 9, Eda teaches that it is known to use to use a conductive adhesive to bond the substrates together (col.40, lines 23-26), which encompasses using a metal or alloy. It would have been obvious to use a conductive adhesive in the method of Eda because Eda teaches that using conductive adhesives is a known technique for bonding. Using a conductive adhesive inherently uses heat and pressure in order to have effective bonding.

As to claims 10-12, see the rejection of claims 1-2 and Fig.31D. In the embodiment of Figure 31, Eda does not explicitly disclose a dielectric layer over the substrate. However, the substrate comprises a dielectric, and further the direct bonding results in a transitional bonding area between the substrate and the quartz, which encompasses a dielectric layer. Still further, Eda teaches a dielectric layer 8 may be interposed between the substrate and the piezoelectric material 2 (Fig.18A). It would have been obvious to one with ordinary skill in the art to have a dielectric layer over the substrate and under the metal electrode in the method of Eda because Eda teaches that silicon oxide layers are useful for bonding substrates together.

As to claim 13, Eda discloses a top layer 22a which is a conductor.

As to claims 15-17, 21-25, see the corresponding rejection of claims 1-14.

Claims 1-2, 4, 6-13 and 15-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and McReynolds (US 5,882,465).

The discussion of modified Eda from above is repeated here.

As to claim 6, Eda discloses to bond the quartz substrates together (col.39, lines 30+), but does not disclose to use a vacuum.

McReynolds teaches that it is useful to apply a vacuum during bonding in order to have optimal contact (col.5, lines 16-19) and to have a more even application of the pressure forcing the substrates together, which improves efficiency, quality and product yield (col.6, lines 49-61).

It would have been obvious to one with ordinary skill in the art to apply a vacuum as taught by McReynolds in the method of Eda because McReynolds teaches that to do so provides

for optimal contact and for a more even application of the pressure forcing the substrates together, which improves efficiency, quality and product yield.

As to claim 7, Eda discloses to use anodic bonding (col.40, lines 4-15) with a silicate bonding layer (quartz). Eda does not disclose to employ a borosilicate bonding layer.

McReynolds teaches that quartz and borosilicate glasses are useful, alternative materials for one another (col.4, lines 25-37) and that quartz typically bonds at higher temperatures than borosilicate glass.

It would have been obvious to one with ordinary skill in the art to use borosilicate as a bonding layer in the method of Eda because McReynolds teaches that it is a known useful alternate silicate glass for quartz, and because McReynolds teaches that it has a lower bonding temperatures, which improves product yield.

As to claim 8, Eda discloses to use heating (col.40, lines 4-8), but does not disclose to use pressure.

McReynolds teaches that a useful bonding technique includes applying heat in combination with pressure (col.4, lines 19-22).

It would have been obvious to one with ordinary skill in the art to use heat and pressure during bonding in the method of Eda because McReynolds teaches that it is a useful technique for bonding.

As to claims 18-20, see the corresponding rejection of claims 6-8.

Claims 1-2, 4, 9-13, 15-17, 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and Kurle et al (US 6,106,735).

The discussion of modified Eda from above is repeated here.

As to claim 1, Eda not explicitly disclose that a plurality of bulk acoustic resonator devices are formed, that the first wafer has a plurality of cavities, or that the second wafer has a plurality of wells. Rather, Eda depicts in Figure 31D that only one of each is formed. Eda also does not disclose to saw to separate the individual devices.

Kurle teaches a method for protecting sensors or arrangements from external influences by forming an airtight seal (col.4, lines 30-35). Electrical elements 2 are provided in a first wafer 1 and bonded to a second wafer 3. The second wafer has a plurality of wells (created by webs 4). During bonding, electrical elements 2 are aligned with the wells of the second wafer (col.2, lines 56-62, Fig. 1D). After bonding, the electrical elements 2 are separated into individual devices (col.3, lines 10-13) by sawing.

It would have been obvious to one with ordinary skill in the art to form a plurality of devices with a corresponding plurality of cavities and wells followed by sawing the composite wafer in the method of Eda because Kurle teaches that forming devices, bonding wafers and then sawing to separate devices is a useful technique for forming devices and because Eda teaches that an advantage is mass production, which is a more efficient method of forming devices.

Claims 1-2, 4, 6-13, 15-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857) in view of Kawai (US 6,300,676 B1) and McReynolds (US

Art Unit: 1765

5,882,465) (as applied to claims 6-8 and 18-20) and Kurle et al (US 6,106,735) (as applied to claims 1 and 15).

The discussion of modified Eda from above is repeated here.

Claims 1, 10-13, 15, 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eda et al (US 5,747,857).

The rejection from the paper mailed 6/29/04 is repeated here. As to the product claims, the amendment to claims 1 and 15 cite the order in which steps are performed, however the same end product is formed whether the holes are pre-formed, as in Eda, or not.

Response to Arguments

Applicant's arguments filed 9/28/04 have been fully considered. The method claims are now rejected over Eda and newly cited Kawai et al. Kawai teaches that it is known to form a via hole for connection to metal tracks after formation of the composite wafer, as opposed to pre-forming the holes.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

Art Unit: 1765

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko

Anita K Alanko
Primary Examiner
Art Unit 1765